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Otter surveillance in SACs: testing the protocol

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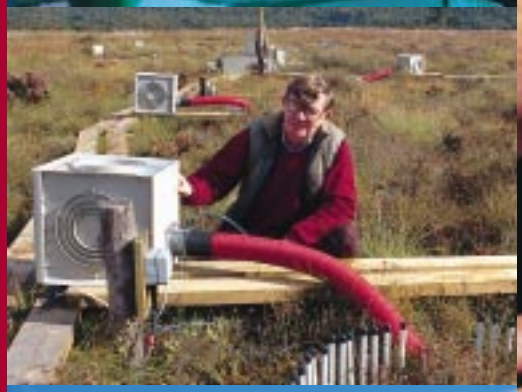

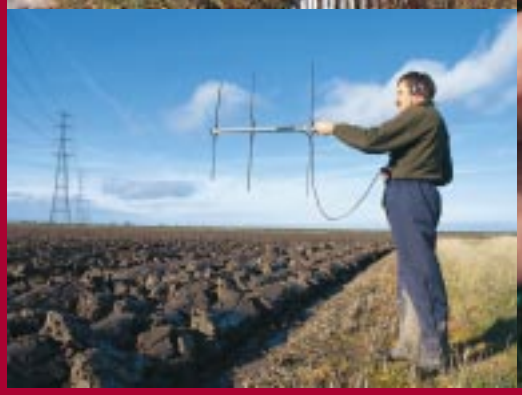

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Number 664

Otter surveillance in SACs: testing the protocol

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Summary

Otter surveys were carried out on five SAC rivers where the species is a primary feature of interest: Camel, Cumbrian Derwent, Eden, Tweed and Wye. The protocol recommended in the report prepared for the Life in UK Rivers project (Chanin 2003) was found be practical and to record a high proportion of positive sites except on the river Derwent, shortly after a severe spate.

Information on the time taken to do surveys and the distance travelled was recorded to simplify costing of future surveys.

Recommendations are made for minor changes to the information recorded during preliminary surveys but no significant changes to the protocol will be necessary.

Contents

Summary
1. Background and brief....9
2. Methods....9
2.1 Identifying sites....9
2.2 Site naming and numbering....10
2.3 Grid references....10
2.4 Surveying sites....11
2.5 Recording....11
2.5.1 Site information....11
2.5.2 Times and distances....11
3. Results....12
3.1 Times and distances....12
3.2 Costs....13
3.3 Site selection....13
3.3.1 Size of waterway....14
3.4 Information on the sites....15
3.4.1 Water levels....15
3.4.2 Need for artificial spraint sites....15
3.4.3 Access....16
3.5 Otter signs....17
3.6 Comparison with other surveys....17
3.6.1 National surveys....17
3.6.2 Regional and local surveys....18
3.6.3 Spot checks in Wales....18
3.7 Factors influencing results....19
3.7.1 Time of year....19
3.7.2 Impact of tourism....22
4. Recommendations....22
4.1 Changes to the protocol....22
4.1.1 Time of year....22
4.1.2 Survey distance....23
4.1.3 Recording form....24
4.1.4 Would less experienced surveyors take longer?....26
4.2 Guidance for surveyors....26
4.2.1 Search pattern....26
4.2.2 Equipment....27
5. Conclusions....27
6. References....28
Appendices....29
Appendix A. List of survey sites with results....29
Appendix B. Survey results....37
Appendix C. Artificial spraint site on Camel....39
Appendix D. a) Otter monitoring form as used in the survey....41
b) Form recommended for future use.....41

1. Background and brief

The Life in UK Rivers Project was undertaken to develop methods for conserving wildlife in rivers designated as Special Areas of Conservation (SACs), including monitoring populations. One of its publications, *Monitoring the otter* (Chanin 2003) recommended a protocol for otters which was designed to provide a simple, quick, but robust mechanism which would yield information that was amenable to statistical testing.

The present study was commissioned by English Nature to test the feasibility of this approach and collect information on time taken to visit each site as well as the distance travelled for accurate costing of the exercise.

Over the past 28 years National Otter Surveys in Britain and elsewhere have been based on the so-called 'standard method' (Reuther and others 2000) which involves searching a distance of up to 600m, usually from a bridge, and recording the presence or absence of otter signs together with a range of habitat descriptors. The SAC Monitoring Protocol simplifies this to record only the most basic information. By confining searches to the close proximity of bridges and only searching spraint sites within 50m of them, the number of sites visited with one day can be considerably increased. However, in order to achieve a suitable sample size in small SACs (60 sites) the distance between sites had to be considerably reduced from the 5-8km recommended in the standard survey. Indeed in small SACs it was considered likely that all suitable bridges would have to be checked

The five English SACs where otters are a primary feature of interest were surveyed (Camel, Derwent, Eden, Tweed and Wye), but work was confined to the English parts of the Tweed and Wye which cross the borders of Scotland and Wales respectively.

Specific objectives were to:

- Identify suitable monitoring sites in the five SACs.
- Survey the sites and test the appropriateness of the method and recording form.
- Quantify the costs.

2. Methods

2.1 Identifying sites

Although the Protocol recommended subdividing large rivers into sub-catchments, this did not apply to these SACs since the total length of waterway available for surveying was too small in each case. In addition, for the Camel, Tweed and Wye it was necessary to survey many sites which were not in the SACs (though within the catchments) as recommended in the Protocol.

In order to simplify recording and make it easy to identify the approximate location of a site, selection was carried out as follows:

Starting at the downstream end, each bridge on the main stem of the river was identified and numbered sequentially from the sea, either to its source or to the National boundary (Wye and

Tweed). This was repeated on tributaries, starting with the largest and progressively numbering smaller streams until 80 to 90 sites had been identified. On the Camel and Tweed, some second order tributaries were included in the selection. Only bridges on public roads, or those to which public roads led, were included and these were identified solely on the basis of information from Ordnance Survey 1:50,000 maps. Thus roads shown without colour ("other roads, drive or track") were omitted. In a few cases 'bridges' turned out to be fords, though most had footbridges alongside. A small number of sites which did not fit these criteria proved to be suitable for survey, for example some weirs in Cumbria and Northumberland and a railway bridge in Penrith.

An effort was made to avoid using large numbers of sites where streams were very small and likely to be culverted rather than bridged. Experience of surveys in Southwest England (Chanin, unpubl.) shows that spraints are less likely to be found at small piped culverts than at other types of road crossing.

2.2 Site naming and numbering

In addition to the sequential numbers referred to above, sites were given a four letter prefix identifying the SAC and tributary in question. Thus CaMn## was used for sites on the main stem of the Camel and DeGr## for sites on the Greta, a tributary of the Derwent.

In some cases (on the Camel, Derwent and Tweed), one or two bridges at the lower end of a small tributary were included but not all the bridges on that tributary. This was done partly to increase sample size without including large number of sites where the streams were very small, but also to fill gaps (particularly along lake sides) where the distances between sites were large. In these cases, rather than add complexity by including a new tributary to the numbering system, the sites were included within the numbering sequence of the river into which they flowed. For example DeCo10 - 12 are on small streams flowing between Loweswater and Crummock Water while the Cocker itself flows out of Crummock Water. Where this has happened, the name of the actual tributary (if shown on the map) is recorded.

When there was no name on the map (some of the smaller Camel tributaries) a local place-name was used to identify the stream. These are indicated in Appendix A by brackets around the name in the Tributary column of the table.

Finally, a substantial tributary of the Eden, the Eamont only had three bridges along its length and two of these were considered unsuitable for surveying. Rather than include a tributary with only a single site, this was included in the Lowther sequence as EdLo01.

Note that the sites which were excluded from the survey are not included in the final numbering sequence on the grounds that this would cause confusion.

2.3 Grid references

The locations of survey sites were first identified on a digitised version of the Ordnance Survey Landranger (1:50,000) maps supplied by Memory Map Inc. Sites were marked and numbered as 'waypoints' on-screen and their grid references exported as text files in the form SX 54321 09876. These were subsequently imported into MS Access and converted to the conventional 'six-figure' reference (SX 123456; see appendix A) and to XY co-ordinates (for export to GIS) to a precision of 10m.

There are obvious inherent inaccuracies of giving a location precise to 1m when the bridge could be several metres wide and several tens of metres long. In addition, Memory Map outputs values at 5m intervals - probably because of the screen resolution used. GIS references are therefore simply truncated to the 10m value **below** the exported value (similar to the convention for 'six-figure' grid references) in the spreadsheet accompanying this report.

2.4 Surveying sites

Sites were visited between 15 December 2004 and 14 April 2005.

As recommended in the Protocol the area beneath and beside the bridge was searched first and if no signs were found there the survey was extended further, up to a distance of 50m on either side of the bridge, checking first the sites most likely to have spraints or footprints. The essential strategy being to determine quickly whether or not signs were present and then move on. It was not intended that the full 100m of stream would be searched at each site as this would substantially increase survey time with no benefit in terms of useful additional information collected.

In many cases it was possible to do a direct search of suitable sites but at some the use of binoculars was essential. This was either because the river bank was inaccessible but spraints or footprints could be seen or because the spraint sites or mud-banks themselves could not be reached because of deep water.

2.5 Recording

2.5.1 Site information

The recording form illustrated in the Protocol was used with minor modifications (See Appendix D). In practice however it was found that there was scope for including far too much information - for example where potential spraint sites were numerous. Conversely at many sites the potential sprainting places were very few and very obvious, ledges under bridges, being a good example. These were present at a high proportion of bridges on the Wye and were the most frequently used spraint sites on that catchment. Subsequently, only the location of sites or footprints more than 5m from the bridge were noted.

Another complicating factor was that, since this survey was carried out in winter when water levels are likely to be high, different spraint sites might be favoured by otters during the summer (when these surveys were originally recommended). Also, more patches of mud and sand are likely to be exposed during the summer.

Detailed notes on access are only given where there may be some doubt as to the best way to get to the river bank.

2.5.2 Times and distances

One of the requirements for the project is to quantify costs for monitoring SACs using this method. In particular the project brief requires the recording of the time taken to visit each site, the number of sites visited within a day and the mileage between sites.

In order to provide information which can be used as flexibly as possible, the following information was recorded:

- Start time and end time at a site, from which both time spent surveying at each site and travel time between sites can be calculated.
- Time travelling to the first site from a base within the catchment (when possible).
- Time travelling to the catchment from the surveyor's home in Devon.
- Mileage reading at each site.
- Mileage at the start of each day.
- Distance between Devon and the catchment 'Base'.

3. Results

3.1 Times and distances

Table 1 summarises the estimated time needed to carry out the surveys on each catchment as well as distances travelled. In each case the time within the catchment has been adjusted on the assumption that the surveyor will start from a significant sized town within the catchment - described as 'Base' in the table. Table 2 records the mean time spent surveying at a site together with the mean distance and travel times between sites on the catchment. Note that this excludes travel time and distance between one tributary and the next. Table 3 shows the additional travelling time and distances involved because surveys were carried out by a person based in Devon.

Table 1. Time (hours) and distance travelled (miles) within the catchment

SAC	Base	Time	Distance
Camel	Bodmin	17	140
Derwent	Keswick	18	100
Eden	Penrith	24	330
Tweed	Berwick	17	190
Wye	Hereford	18	220

Table 2. Mean survey time (decimal minutes) at each site and time and distance (miles) between sites on the same tributary

SAC	Survey time	Travel time	Total time	Distance
Camel	7.0	5.0	12.0	1.5
Derwent	7.7	5.3	13.0	1.9
Eden	9.1	7.9	17.0	2.9
Tweed	7.5	5.3	12.8	2.0
Wye	8.1	6.3	14.4	2.5

Table 3. Time and distance involved in getting to each SAC from Devon

SAC	Time	Distance
Camel	3	130
Derwent	12	680
Eden	12	660
Tweed	16	930
Wye	6	240
Total	**49**	**2640**

3.2 Costs

The actual costs of carrying out these will depend on the rate charged and this will vary considerably depending on whether independent contractors are used or not. Table 1 shows that it took approximately 6 hours longer to survey the Eden. This river is the largest (extreme points surveyed being ca 70km apart but it was also subject to a modest handicap following snowfall. Allowing for contingences and surveyors with a little less experience, a time of 3 - 3.5 days would seem adequate for fieldwork. Time would also be needed for the preparation of maps and recording forms and for producing results in a suitable format.

Assuming that the work was done by a local person (no subsistence) paid at the rate of £300 per day and 40p per mile the Camel, Derwent, Tweed and Wye could be surveyed for approximately £1300 each. Based on similar assumptions, £1,650 should be allowed for the Eden.

The additional cost of employing the same person to carry out all five surveys would be approximately £3,700 (£740 per SAC) if they were based in Devon. The cost would be less for someone living closer to the three northern SACs, ca 45% less for someone based in Penrith for example.

3.3 Site selection

During the survey, sites were classified into three categories: those which are clearly suitable; those which might be suitable and those which are definitely not suitable.

Sites were rejected for three principle reasons:

- Difficult or impossible to gain access to the riverside for surveying. NB sites which could be adequately surveyed without gaining access to the riverside were **not** excluded.
- No suitable spraint sites and no scope for installing an artificial spraint site.
- Very small, usually culverted, less than a metre wide and 10cm deep, often surrounded by impenetrable hedges.

Sites which were positive at the time of survey are, by definition, suitable as is any site where potential spraint sites are obvious.

Sites which were considered 'possible' included those where:

- It was considered likely that lower water levels in the summer would probably expose suitable places not visible at the time of survey, ledges or sand/mud banks beneath the bridge for example.
- Access to the bank was limited, either with 'Private' notices or because they were within gardens.
- An artificial spraint site could be installed to compensate for the lack of natural sites.

These were reviewed after the survey was complete in order to determine whether or not they should be used. The first consideration was whether there were 60 suitable sites without including those in this category. This was the case on the Wye so none were included in the final list of sites. In other SACs there was a small shortfall which was made up by selecting the 'next best' sites from this list of 'possibles'.

A full list of sites together with grid references, physical data and survey results is included as Appendix A.

Table 4. Number of sites surveyed and selected for each catchment

SAC	Surveyed	Selected
Camel	78	60
Derwent	74	60
Eden	69	62
Tweed	66	55
Wye	70	63
TOTAL	357	300

3.3.1 Size of waterway

The method used to identify sites for initial survey involved first selecting bridges on the main river, then the largest tributaries in order to include reasonable numbers of sites where the rivers were large or medium sized. Overall, in every catchment, the number of very small bridges or culverts is likely to greatly outnumber these. Further selection occurred during the survey process when sites where the streams were very small and culverted were rejected unless they had good spraint sites nearby.

Despite this, on the Camel, the proportion of 'large' sites was very low compared to other SACs due to the small size of the river.

Figure 1 shows the proportions of sites at different widths in each SAC and it is clear that the smaller catchments, Camel, Derwent and Tweed have the highest proportion of small streams. On the Camel, only three sites exceeded 15m in width.

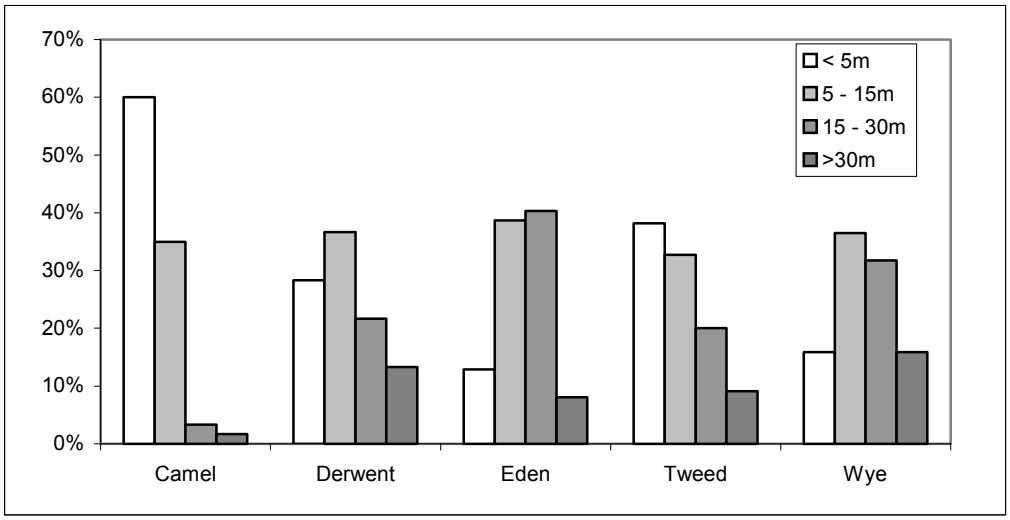

Figure 1 Stream size as indicated by width at each site

3.4 Information on the sites

3.4.1 Water levels

The survey monitoring form includes the question "are water levels normal?" It was anticipated that the surveys would be carried out by people with local knowledge who would be able to make an assessment based on their knowledge of the area under normal circumstances.

Coming from outside the catchment in each case, it was only possible to make an assessment of water levels based on the evidence of recent flooding and other indicators such as high turbidity.

It would appear that at the time of survey, all of these rivers were at a level which is typical for the time of year. Based on experience with upland rivers in Devon, it seems likely that during the summer, water levels would normally be lower, exposing more spraint sites in the form of boulders, ledges under bridges etc and more mud/sand banks which would show up footprints. The only SAC where precipitation (rain and snow) had any discernible effect on the river during the survey itself was the Derwent. Water levels did not noticeably rise but the water was more turbid towards the end of the second day of surveying.

In all SACs it was clear that there had been higher water levels at some time in the previous few weeks. On the Derwent there had been a major flood event only 10 days previously (see below) while on the Tweed there had been a less severe spate approximately two weeks previously. The severe flooding which had affected the Derwent had an even greater impact on the adjacent Eden, but this river was surveyed a month later.

3.4.2 Need for artificial spraint sites

Bridges which would only be suitable if an artificial spraint site could be installed were described as 'possible sites' during the preliminary survey. In reviewing these, preference was given those which were likely to be suitable under summer conditions or where

permission might easily be obtained for access. Those where artificial spraint site would be needed were given the lowest priority.

In the end, only a single site was selected where an artificial site might be beneficial (CaAn04). Further details are provided in Appendix C. At a second site (TwTi03) it was possible to move a breeze block slab which had been discarded in recent work on the culvert. This was placed beside the entrance to the culvert where it would not obstruct the flow (see picture below).

Artificial spraint site installed at TwTi03

3.4.3 Access

When carrying out extensive otter surveys which involve short visits to large numbers of sites the problem of access is usually dealt with by seeking permission where it is possible to do so on the spot but not otherwise. The complexities of land tenure and the difficulty of tracking down ownership at every site makes it impossible to carry out such work in any other way.

For all catchments, a note was made on the recording forms of any obvious limits to access and where and when to ask permission if it can be done easily. However, the assumption was made that, provided obviously private areas (gardens, signs) were avoided, carrying out an otter survey would be acceptable.

Following discussions during the progress of this project it became clear that what is acceptable for self employed surveyors may not be for civil servants. Certain staff of the Environment Agency are issued with warrants which enable them to exercise powers under the Water Resources Act 1991 (sections 169-172) to go onto land for the purposes of undertaking surveys, sampling etc but these are not available to staff working for Statutory Nature Conservation Organisations.

While surveying the Tweed catchment additional records were kept of public access to the river bank - in areas of open access for example, via a footpath or because the bank and

bridge were within the highway boundary. It was found that this was so at approximately 50% of sites.

Under these circumstances it may be more effective for English Nature to sub-contract the surveys rather than use their own staff. The work could be done either by the Environment Agency, or by an individual who would take responsibility for dealing appropriately with circumstances. A further possibility may be collaboration with the Environment Agency if this would enable an independent surveyor to work under their supervision.

3.5 Otter signs

In most SACs signs of otters were found at between 74% and 90% of sites, a surprisingly high proportion (table 5). However the proportion of positive sites on the Derwent was noticeably lower (50%), probably as a result of the recent spate.

Table 5. Proportion of positive sites

SAC	% Pos.
Camel	80%
Derwent	50%
Eden	82%
Tweed	74%
Wye	87%

Despite this, there was no apparent impact on the number of spraints per positive site on the Derwent which was slightly higher than on the Eden where there had been more time for recovery. However the Derwent had a higher proportion of fresh spraints than other sites which may reflect the relatively short time since the spate.

Table 6. Proportion of spraints recorded that were fresh ('not yet dry') at each site and mean number of spraints per positive site.

SAC	% Fresh	Mean No.
Camel	40%	2.7
Derwent	60%	2.1
Eden	48%	1.8
Tweed	35%	2.7
Wye	36%	4.7

Maps showing the distribution of sites are in Appendix B.

3.6 Comparison with other surveys

3.6.1 National surveys

On those catchments where there were adequate numbers of sites for comparison, the results for the present survey were broadly comparable with the National Survey of 2000 - 2002 (Crawford 2003) though there was no consistent trend for SAC Survey results to be either higher or lower than National Surveys (Table 7).

Table 7. Comparison of SAC survey results with those from the most recent National Survey

	Sites	4th National Survey	Present Survey
Camel	13	92%	80%
Derwent	1	-	50%
Eden	75	69%	82%
Tweed	23	87%	74%
Wye	70	83%	87%

3.6.2 Regional and local surveys

The Northwest Region of the Environment Agency has been carrying out surveys in its area for several years, doing one third each year apart from during the Foot and Mouth Disease epidemic in 2001. The Agency's results show a clear increase in positive sites on the Derwent between 1998 and 2002 and on the Eden from 2000 to 2004 (Table 8).

Here too, the results are broadly comparable with the present survey but note that there is a difference in technique since the Agency staff only check a distance of up to 15m from the bridge. In addition the Agency staff search all bridges whereas in the SAC survey may small bridges and those which are obviously unsuitable are omitted.

There has been a modest increase in positive sites on the Camel since the preliminary survey carried out in 2002 as part of the Life in UK Rivers Project (Chanin 2003). However different selection criteria were used on that occasion and this should not be taken to reflect a change in otter behaviour or distribution.

Table 8. Comparison with earlier surveys carried out on the Derwent and Eden by Environment Agency staff and the Camel (reported in Chanin 2002)

	1998	2000	2002	2004	Present Survey
Camel			70%		80%
Derwent	11%		47%		50%
Eden		48%		65%	82%

3.6.3 Spot checks in Wales

The proportion of positive sites (apart from on the Derwent) was much higher than predicted in the Life Report (Chanin 2003) where data from the Otter Surveys of Wales were used to show that spot checks (where only the bridge was surveyed) yielded a lower proportion of positive sites than standard surveys. Thus a hydrometric area which had 70% of its sites positive in the Welsh National Survey could be expected to have between 40% and 50% positive spot checks (90% confidence limits).

This difference is not reflected in the comparisons between the most recent National survey and the SAC surveys in Table 7, which shows that the Protocol does not necessarily lead to a reduction in positive sites. Note however that the national surveys may not have been carried out at the same time of year as the corresponding SAC survey. The influence of distance surveyed is discussed more fully in section 4.1.2

3.7 Factors influencing results

3.7.1 Time of year

Addressing the question of when to carry out surveys Chanin (2003) stated that:

> *"... there would be considerable benefit in carrying out surveys during the period May - September when water levels are less variable. This is also the period when water levels are lowest which has two significant advantages: a) sand and mud banks are most likely to be exposed and reveal footprints; b) working in rivers is safer."*

The present study had to be carried out from December to March which, on the above grounds would appear not to be ideal. In practice however, signs were found at a high proportion of sites in most SACs suggesting that winter surveying can provide useful data, even on upland rivers. However both snowfall and spates did have an impact on the survey.

Impact of recent spates

All rivers showed some signs of recent spates with trash lines on the Camel, Tweed and Wye indicating that, at some point during the preceding weeks, the rivers had been 1-2m higher than at the time of survey. However the most severe spates were recorded on the Eden and, to a lesser extent, the Derwent. These had suffered considerable damage including the washing away of sections of road and some foot bridges, together with extensive damage to abutments, walls and even foundations. In places the trash line was as much as 5m above water level.

Flood debris on the Eden

Damage on the Caldew

Derwent: This river was surveyed on 17 to 19 January, ten days after the floods, whereas the Eden was done on 21 to 23 February, more than 6 weeks after the event. There was a marked difference in the proportion of positive sites on the two rivers, 82% on the Eden and 50% on the Derwent. This could be explained either by the proximity of the Derwent survey to the flood event or by the fact that the Derwent has been colonised more slowly than the Eden and otter populations continue to expand as illustrated by the Environment Agency data (table 8). Two sources of information provide some evidence to support the first hypothesis.

First, the proportion of fresh spraints was higher on the Derwent than other SACs (figure 2) which would be predicted if the floods washed all spraints away.

Second, the impact of a spates is likely to be greatest on the main rivers which, accumulating water from all tributaries, may be expected to rise the most and be subject to the greatest scouring. This was the case on the Derwent where only two of the twelve sites surveyed on the main river had signs of otters (17%) compared to 36% for the largest tributary (the Greta) and 65% for all other sites combined. These differences are significant ($Chi^2 = 9.42$; 2df; $p < 0.01$). No such effect was detected on other SACs

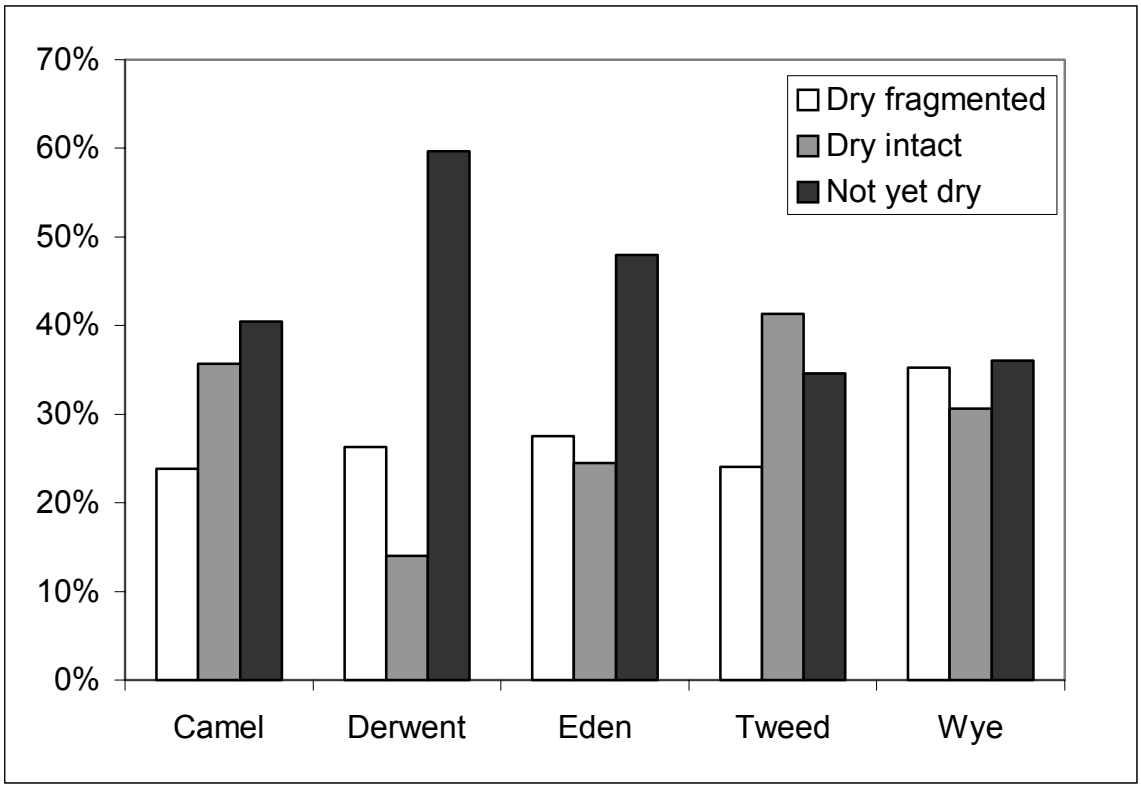

Figure 2 Proportion of spraints of different ages on each SAC. Spraint categories approximate to old, recent, fresh.

Eden: The flooding on this river also had a significant effect on the survey. As bridges constrict the river flow during flooding, there is a tendency, when levels are very high, for increased scouring beneath them. Consequently at a higher proportion of Eden bridges, even on tributaries, the water was too deep for wading and there were fewer bridges with large boulders suitable for sprainting beneath them.

Snow

Approximately 3cm of snow fell overnight before the second and third days of surveying on the Eden. This had three main effects.

First, travelling was mildly impaired. Journey times were longer and greater care had to be taken in finding safe parking places.

Second, otter spraints and footprints may have been obscured at some sites, although there was no clear evidence that this happened and signs were found at most sites that were surveyed while snow was lying.

Snow covered boulders on the river Eden

Third, the survey of the river Tweed was postponed from March to April because there was a risk it would have had to be aborted if snowfall had increased.

3.7.2 Impact of tourism

As the surveys were carried out during winter there was no impact from tourists. However, all of these rivers are in attractive countryside which is subject to tourism. Many of the sites searched are sufficiently off the beaten track for this not to be a problem but there will undoubtedly be greater traffic during the tourist seasons and in the Lake District in particular (Derwent catchment) both travelling and parking are likely to be more difficult and surveys may take longer.

4. Recommendations

4.1 Changes to the protocol

4.1.1 Time of year

The Protocol recommends that surveys should be carried out between May and September when water levels are less variable. This was not possible for the present surveys which were carried out between December and April. However, the results demonstrate that it is possible to do surveys in winter and record signs at a high proportion of sites.

In the protocol a period of at least five days between spate and survey is recommended but experience on the Derwent suggests that surveying ten days after a major spate may have a significant impact. On the other hand, surveying on the Eden shows that a period of six weeks is adequate for signs to be refreshed by otters so that a high percentage of positive results is recorded. Less severe flooding on the Tweed seemed not to have had an effect after two weeks. Winter spates are likely to be more severe than those in summer and the storms in Cumbria in January 2005 were particularly severe.

The survey program itself was not disrupted by rain but it was affected by snow. In particular the Tweed survey had to be deferred because of the possibility of snow during the planned survey period. This problem is likely to be worse in the North than in central or southern England.

Taking all these factors into consideration, the requirement to carry out surveys in the summer can be seen to be sensible. However it would be possible to undertake surveys in the winter if there were strong reasons for doing so.

Recommendation

As far as possible, surveys should always be carried out at the same time of year on any one SAC, preferably during the period May - September. The gap between surveys and severe spates should be extended from five days to four weeks, though a period of two weeks would be adequate for smaller scale events.

4.1.2 Survey distance

For the Environment Agency surveys in the North West, searching was restricted to within 15m of each bridge rather than the 50m recommended in the SAC monitoring protocol. Although the reasons are not explicitly stated, it seems likely that this is intended to achieve a satisfactory balance between the number of sites that can be searched and the time spent at each - the same principle operating in the SAC monitoring recommendations.

In the first three Welsh National Otter Surveys sites which were checked using the standard survey method were supplemented by a large number of 'spot checks' where only the bridge and its immediate environs (within 10m) were searched. These data were used in the rationale for the SAC monitoring protocol as an argument for reducing the length of river surveyed.

Using data from the recording forms it is possible to determine which sites would have been positive if surveys had been confined to the vicinity of the bridge itself or 15m from it, as in the Environment Agency surveys. Table 9 shows how these compare with the results for the full survey.

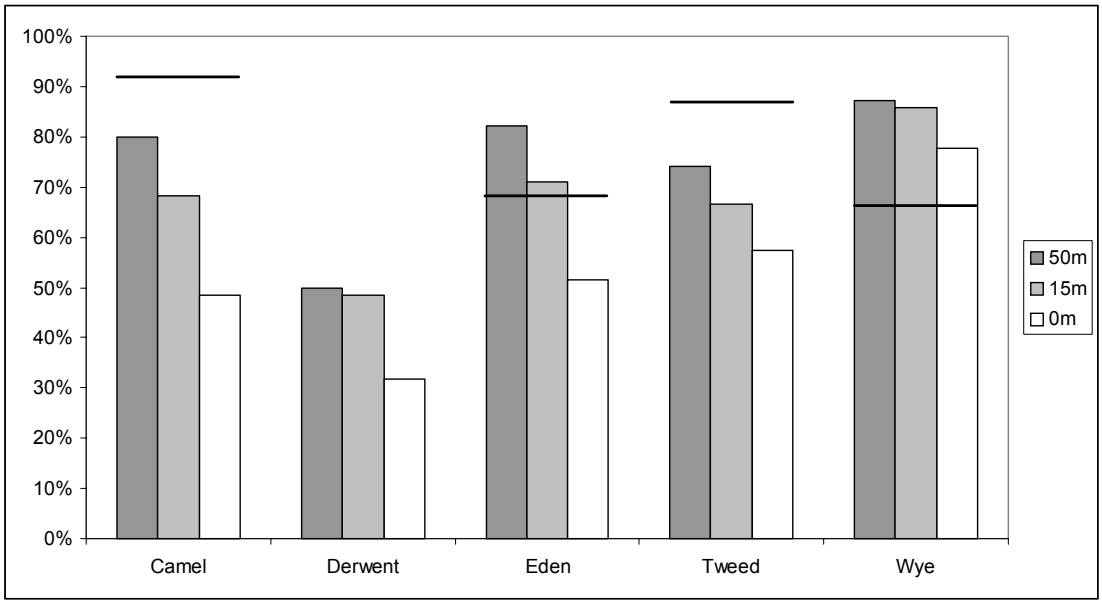

Figure 3 The proportion of sites that would have been positive had surveys been confined to the vicinity of the bridge (0m), within 15m of the bridge or the whole site.

The National Survey result (from table 7) is shown as a horizontal bar.

It is clear that in each case shortening the distance surveyed reduces the proportion of positive sites though the influence may vary, being apparently least on the Wye.

The only reason for reducing the survey distance would be to reduce the time spent at each site, enabling more to be visited per day. In practice however, a considerable number of sites can be checked using the current protocol. The benefits of reducing the distance even further would not seem to provide any significant gains in terms of time.

One reason for not changing the distance is that on waterways of a different character (lowland streams for example) there may a much higher proportion of sites where signs are not found at the bridge itself but nearby. Indeed there may be an argument for increasing the distance surveyed on some waterways, although there is no information at present on which to make a decision.

Recommendation

No change should be made to the distance from the bridge that is searched but the need for surveyors to first search under and around the bridge should be emphasized. Other potential spraint sites within 50m should only be searched if no signs are found close to the bridge.

4.1.3 Recording form

The survey form was designed with five purposes in mind:

1. To record basic physical information about the site (ie width and depth);
2. To record signs of otters if present and their nature;
3. To provide information on which a decision can be made about whether or not the site should be used for monitoring (suitability);
4. To collect information on where artificial spraint sites should be installed;
5. To make it easier for different surveyors to carry out subsequent surveys.

In practice the first three functions (mainly the top section of the form) were easily fulfilled, but problems did arise with the last two purposes.

Physical information: One minor change that was made under the physical dimensions section was to increase the number of width categories to four by splitting the largest into 15-30m and >30m. This was done because it was clear that while on the Camel (used in the pilot study) few bridges were wider than 15m, a considerable number on the river Wye were, all of them on the main river.

Spraint details: In the rationale for the SAC Monitoring Protocol, I recommended that numbers of spraints should be recorded, even though there is no evidence, as yet, that these data have any value. It is also worth bearing in mind that these numbers will only reflect the number of spraints at the first sprainting place detected at a monitoring site, not the number of spraints within 50m of the bridge. In the current surveys, the mean number of spraints per site varied from 1.8 to 4.7 between SACs but there is no reason for supposing that there are any differences in otter density between them.

The recording form goes further, asking for numbers of spraints in three categories: dry fragmented, dry intact and not yet dry. These categories clearly give some indication of the

age of the spraint and probably approximate to spraints that were deposited a few months, weeks or days before the survey.

Again, the value of this in terms of the otter population is difficult to assess, although at an individual site, the presence of spraints of varying age is indicative of visits from otters over a period of time. The fact that there was a very high proportion of 'not yet dry' spraints on the Derwent shortly after a severe flood event lends support to the fact that the low number of positive sites in that SAC might be a result of the flooding However, the mean number of spraints per site on the Derwent is greater than the Eden and not a great deal less that the Camel and the Tweed.

The conclusion must be that it may be worth collecting these data, since they cost virtually no time but their interpretation should be undertaken with considerable caution.

Suitability: In most cases it was possible to make a decision on the spot as to whether or not a site was suitable for inclusion in the survey. Of the 357 sites visited, 50 were rejected as being unsuitable during surveys and only half a dozen were considered for selection after fieldwork had been completed. Some of these were also rejected out of hand, simply because enough clearly suitable sites were identified during fieldwork. In the end it was only on the Camel and the Tweed that decisions had to be made on the basis of field notes. For these few 'possibly suitable' sites, it is important to record as much information as possible.

Four types of information were collected for the benefit of subsequent surveyors, potential spraint locations, access, parking and hazards and there are limitations to the value of all of these.

Potential spraint and footprint sites: As these surveys were carried out in winter and spring, it is likely that, if future surveys are carried out at the preferred time of year, other sites where spraint or footprints could be found will be revealed at lower water levels. In addition, an experienced surveyor would immediately identify likely sites (most of which were around the bridges) and an inexperienced surveyor could be fairly quickly trained (though see section 4.1.4).

In practice recording this information was only useful because it enabled a comparison to be made between the protocol used here, that adopted by the Environment Agency for its North West Region otter surveys and the spot checks carried out in early Welsh National Surveys.

Access to the waterside: The problems surrounding access were described in 3.2.4. Brief notes of where to ask permission were recorded where appropriate, as well as the best route for gaining access to the river bank where that was not immediately obvious (46 sites).

Parking: In most cases it was obvious that parking at the roadside, in a gateway or lay-by would be possible. Although notes were made at most sites, in practice it would be better to only make notes where the best parking place is not obvious.

Hazards: Notes were made for 26 sites, mainly concerning the need for care on major roads, the presence of deep water and/or steep slopes and, in a few cases, the presence of giant hogweed.

Recommendations

- The diagram for potential spraint sites, footprints etc can be omitted but surveyors should be urged to concentrate note taking on the most important factors: hazards, parking places which are not obvious, the need to ask permission and the reasons why a site is considered 'possibly suitable'.
- Information on spraint numbers should continue to be collected but surveyors warned not to interpret differences in these as reflecting changes in the otter population.

4.1.4 Would less experienced surveyors take longer?

Inexperienced surveyors might affect the results in a number of ways. They may miss signs that a more experienced surveyor would notice or misidentify signs. They are also likely to take longer because they have less experience at identifying likely spraint sites. On the other hand, surveyors with experience of otter surveys can also take longer than 'necessary', possibly because of a desire to maximise the number of positive sites. This problem could be over come either by setting a time limit per site, or by careful briefing.

The Environment Agency North West Region used their otter surveys as part of an in-house training scheme so that experienced surveyors were accompanied by novices. They found that "15 -20 sites a day is easily achievable - more than this can be done if you are working alone" (Rachel Harding, pers. comm.). Chris Farmer, carrying out a BSc project on otters in the Midlands found that he could survey 25-30 sites in one day (pers. comm.). On the other hand, Rob Strachan (pers. comm.) found that surveyors he employed to carry out the Fourth Otter Survey of Scotland took considerably more time per site than he had anticipated, despite considerable experience.

Setting a time limit for surveys has attractions but there are some sites where more time is needed, particularly large rivers where it may be necessary to go back to the bridge to cross from one site to the other, rather than wade.

On balance it seems that the times achieved during the present surveys are comparable with other experienced surveyors. In order to ensure reasonable comparability between surveys it would be advisable to always use such people. However they need to be firmly briefed to ensure that they search in a consistent manner - see below.

Recommendations

- As far as possible monitoring should be carried out by surveyors with considerable experience with otters.
- No time limit should be set for surveying a site.

4.2 Guidance for surveyors

4.2.1 Search pattern

After visiting over 300 sites within a few weeks it is clear that one of the keys to effective surveying is to adopt an appropriate searching strategy. The majority of spraint sites and most footprints were found under or beside the bridges, fords or weirs which formed the focus of

survey sites. In most, though not all cases, other sites obviously had a high potential for footprints or spraints and rather than search every inch of the bank, it was most efficient to check these first.

The recommended approach to surveying a site would be to search under the bridge first, then immediate its surroundings, then other obvious spraint sites (boulders, bases of trees, outfalls, confluences) or mud/sand banks where footprints might be found. Only search the banks and lines of trees or large numbers of boulders after this.

4.2.2 Equipment

Contrary to the statement in the monitoring protocol document, binoculars are essential for successful surveying.

Where surveys are carried out by someone who is not a local, surveying, and particularly parking, within towns would be much easier with a suitable street map. I recommend obtaining a copy of (for example) the Ordnance Survey/Philip's Street Atlas for the county in question.

Parking in Cumbrian Towns would be much easier if a parking disc was obtained before the start of the survey.

5. Conclusions

The results of these surveys show that the Protocol can provide a practical approach to monitoring otters in SACs, even those that are fairly small like the Camel. It is also clear that it would be possible to repeat surveys using the same protocol at intervals in order to compare results over a period of time.

There are however three questions which cannot be answered on the basis of the information available so far:

1. Would the results be similar if the same survey protocol was used in the summer, the time when the surveys should have been undertaken?

2. Are the results form the Derwent a consequence of surveying shortly after the ever spate in January 2005?

3. Will the method be equally effective on lowland streams where rocks and boulders are less numerous?

The first two questions could be answered by a limited repeat of the surveys - on the Eden and Derwent for example. The third by a pilot survey on a lowland SAC such as the River Itchen.

6. References

CHANIN. 2003. Ecology of the European otter *Lutra lutra*. *Conserving Natura 2000 Rivers Ecology Series*, No 10. Peterborough: English Nature.

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REUTHER, C., and others. 2000. Surveying and monitoring distribution and population trends of the Eurasian otter *Lutra lutra*. *Habitat,* 12, 1-148.

Appendices

Appendix A. List of survey sites with results

Site Ref	Grid Ref	SAC	Tributary	Signs
CaAm01	SW 998753	Camel	Amble	Yes
CaAm02	SW 996760	Camel	Amble	Yes
CaAm03	SW 992766	Camel	Amble	Yes
CaAm04	SX 000772	Camel	Amble	Yes
CaAn01	SX 010714	Camel	Allen	Yes
CaAn02	SX 031739	Camel	Allen	No
CaAn03	SX 045758	Camel	Allen	Yes
CaAn04	SX 052777	Camel	Allen	No
CaAn05	SX 062787	Camel	Allen	Yes
CaAn06	SX 071806	Camel	Allen	No
CaAn07	SX 078814	Camel	Allen	Yes
CaAn08	SX 087823	Camel	Allen	No
CaAn09	SX 092834	Camel	Allen	Yes
CaCr01	SX 110800	Camel	Crowdy	Yes
CaCr02	SX 119814	Camel	Crowdy	No
CaCr03	SX 121821	Camel	Crowdy	No
CaCr04	SX 127826	Camel	Crowdy	Yes
CaDk01	SX 088738	Camel	De Lank	Yes
CaDk02	SX 114759	Camel	De Lank	Yes
CaDk03	SX 119755	Camel	De Lank	Yes
CaDk04	SX 131764	Camel	De Lank	No
CaLa01	SX 044670	Camel	(Laveddon)	Yes
CaLa02	SX 047662	Camel	(Laveddon)	Yes
CaLa03	SX 051659	Camel	(Laveddon)	Yes
CaLa04	SX 055656	Camel	(Laveddon)	Yes
CaLa05	SX 059651	Camel	(Laveddon)	No
CaMn01	SX 013695	Camel	Main	Yes
CaMn02	SX 015684	Camel	Main	Yes
CaMn03	SX 040673	Camel	Main	Yes
CaMn04	SX 047678	Camel	Main	Yes
CaMn05	SX 065715	Camel	Main	Yes
CaMn06	SX 088731	Camel	Main	Yes
CaMn07	SX 082742	Camel	Main	Yes
CaMn08	SX 084751	Camel	Main	Yes
CaMn09	SX 089763	Camel	Main	Yes
CaMn10	SX 089778	Camel	Main	Yes
CaMn11	SX 097805	Camel	Main	No
CaMn12	SX 098810	Camel	Main	Yes
CaMn13	SX 103827	Camel	Main	Yes
CaMn14	SX 106838	Camel	Main	Yes
CaMn15	SX 115837	Camel	(Tregoodwell)	Yes

Site Ref	Grid Ref	SAC	Tributary	Signs
CaMn16	SX 109855	Camel	Main	Yes
CaMn17	SX 112867	Camel	Main	Yes
CaMn18	SX 130879	Camel	Main	No
CaRu01	SX 015678	Camel	(Ruthern)	Yes
CaRu02	SX 012668	Camel	(Ruthern)	Yes
CaRu03	SW 997659	Camel	(Ruthern)	Yes
CaRu04	SW 980647	Camel	(Ruthern)	No
CaRu05	SW 975643	Camel	(Ruthern)	Yes
CaRu06	SW 981635	Camel	(Ruthern)	Yes
CaTh01	SX 035672	Camel	(Threewater Stream)	Yes
CaTh02	SX 037666	Camel	(Threewater Stream)	Yes
CaTh03	SX 038655	Camel	(Threewater Stream)	Yes
CaTh04	SX 035646	Camel	(Threewater Stream)	No
CaTm01	SX 011662	Camel	(Tremore Stream)	Yes
CaTm02	SX 008656	Camel	(Tremore Stream)	Yes
CaTm03	SX 010649	Camel	(Tremore Stream)	Yes
CaTm04	SX 008645	Camel	(Tremore Stream)	Yes
CaTv01	SX 050782	Camel	(Trevorrian Stream)	Yes
CaTv02	SX 047786	Camel	(Trevorrian Stream)	Yes
DeBr01	NY 090315	Derwent	Broughton	Yes
DeBr02	NY 094325	Derwent	Broughton	Yes
DeBr03	NY 080341	Derwent	Broughton	No
DeBr04	NY 083347	Derwent	Broughton	No
DeCo01	NY 122307	Derwent	Cocker	Yes
DeCo02	NY 122303	Derwent	Cocker	Yes
DeCo03	NY 119293	Derwent	Cocker	Yes
DeCo04	NY 130283	Derwent	Cocker	No
DeCo05	NY 151256	Derwent	Cocker	Yes
DeCo06	NY 156248	Derwent	Whit Beck	Yes
DeCo07	NY 153223	Derwent	Liza Beck	Yes
DeCo08	NY 148214	Derwent	Cocker	Yes
DeCo09	NY 140208	Derwent	Park Beck	Yes
DeCo10	NY 144205	Derwent	Park Beck	No
DeCo11	NY 175169	Derwent	Mill Beck	No
DeCo12	NY 194149	Derwent	Gatesgarthdale Beck	No
DeCo13	NY 210148	Derwent	Gatesgarthdale Beck	No
DeCo14	NY 218141	Derwent	Gatesgarthdale Beck	No
DeGr01	NY 262237	Derwent	Greta	Yes
DeGr02	NY 268235	Derwent	Greta	No
DeGr03	NY 274238	Derwent	Greta	No
DeGr04	NY 301240	Derwent	Naddle Beck	Yes
DeGr05	NY 314246	Derwent	Greta	No
DeGr06	NY 319248	Derwent	Greta	Yes
DeGr07	NY 325250	Derwent	Greta	Yes
DeGr08	NY 339260	Derwent	Greta	Yes
DeGr09	NY 349264	Derwent	Greta	No
DeGr10	NY 353267	Derwent	Greta	No
DeGr11	NY 358268	Derwent	Glenderamackin	Yes

Site Ref	Grid Ref	SAC	Tributary	Signs
DeGr12	NY 362271	Derwent	Greta	No
DeGr13	NY 367291	Derwent	Barrow Beck	Yes
DeGr14	NY 362302	Derwent	Greta	No
DeMn01	NX 999294	Derwent	Main	No
DeMn02	NY 007290	Derwent	Main	No
DeMn03	NY 081312	Derwent	Main	No
DeMn04	NY 102311	Derwent	Main	No
DeMn05	NY 116307	Derwent	Main	No
DeMn06	NY 164333	Derwent	Main	No
DeMn07	NY 199321	Derwent	Main	Yes
DeMn08	NY 228316	Derwent	Chapel Beck	Yes
DeMn09	NY 250241	Derwent	Main	No
DeMn10	NY 251239	Derwent	Main	No
DeMn11	NY 264189	Derwent	Watendlath Beck	No
DeMn12	NY 254174	Derwent	Main	No
DeMn13	NY 257151	Derwent	Stonethwaite Beck	No
DeMn14	NY 263138	Derwent	Stonethwaite Beck	No
DeMn15	NY 250137	Derwent	Main	Yes
DeMn16	NY 239127	Derwent	Main	No
DeMr01	NY 057297	Derwent	Marron	Yes
DeMr02	NY 056292	Derwent	Marron	Yes
DeMr03	NY 059277	Derwent	Marron	No
DeMr04	NY 059249	Derwent	Marron	Yes
DeMr05	NY 074239	Derwent	Marron	Yes
DeMr06	NY 067217	Derwent	Marron	Yes
DeMr07	NY 065206	Derwent	Colliersgate Beck	Yes
DeSJ01	NY 314231	Derwent	St John's Beck	Yes
DeSJ02	NY 317214	Derwent	St John's Beck	Yes
DeSJ03	NY 317205	Derwent	St John's Beck	Yes
DeSJ04	NY 315195	Derwent	St John's Beck	Yes
DeSJ05	NY 320129	Derwent	Wyth Burn	No
EdCa01	NY 399554	Eden	Caldew	Yes
EdCa02	NY 370487	Eden	Caldew	Yes
EdCa03	NY 374459	Eden	Caldew	Yes
EdCa04	NY 366429	Eden	Caldew	Yes
EdCa05	NY 357418	Eden	Caldew	No
EdCa06	NY 343388	Eden	Caldew	Yes
EdCa07	NY 361376	Eden	Caldew	Yes
EdCa08	NY 368364	Eden	Caldew	Yes
EdCa09	NY 360342	Eden	Caldew	Yes
EdCa10	NY 356319	Eden	Caldew	Yes
EdHb01	NY 668202	Eden	Hoff Beck	Yes
EdHb02	NY 675175	Eden	Hoff Beck	No
EdHb03	NY 682158	Eden	Hoff Beck	Yes
EdHb04	NY 685147	Eden	Hoff Beck	Yes
EdHb05	NY 685136	Eden	Hoff Beck	No
EdIr01	NY 476580	Eden	Irthing	Yes
EdIr02	NY 495600	Eden	Irthing	Yes

Site Ref	Grid Ref	SAC	Tributary	Signs
EdIr03	NY 493601	Eden	Irthing	Yes
EdIr04	NY 513623	Eden	Irthing	Yes
EdIr05	NY 553633	Eden	Irthing	Yes
EdIr06	NY 564639	Eden	Irthing	Yes
EdIr07	NY 584643	Eden	Irthing	Yes
EdIr08	NY 632664	Eden	Irthing	Yes
EdKW01	NY 527643	Eden	Kings Water	Yes
EdKW02	NY 554667	Eden	Kings Water	Yes
EdKW03	NY 566674	Eden	Kings Water	Yes
EdKW04	NY 577674	Eden	Kings Water	Yes
EdLo01	NY 522287	Eden	Eamont	Yes
EdLo02	NY 524282	Eden	Lowther	Yes
EdLo03	NY 518239	Eden	Lowther	No
EdLo04	NY 517222	Eden	Lowther	Yes
EdLo05	NY 520180	Eden	Lowther	Yes
EdLo06	NY 534165	Eden	Lowther	Yes
EdLo07	NY 551142	Eden	Lowther	Yes
EdLo08	NY 560125	Eden	Lowther	Yes
EdLy01	NY 600246	Eden	Lyvennet	Yes
EdLy02	NY 612232	Eden	Lyvennet	No
EdLy03	NY 618211	Eden	Lyvennet	No
EdLy04	NY 619200	Eden	Lyvennet	Yes
EdLy05	NY 624172	Eden	Lyvennet	Yes
EdLy06	NY 625162	Eden	Lyvennet	Yes
EdLy07	NY 622149	Eden	Lyvennet	Yes
EdLy08	NY 622138	Eden	Lyvennet	No
EdMn01	NY 400565	Eden	Main	Yes
EdMn02	NY 469567	Eden	Main	Yes
EdMn03	NY 507460	Eden	Main	Yes
EdMn04	NY 550404	Eden	Main	Yes
EdMn05	NY 566335	Eden	Main	Yes
EdMn06	NY 603281	Eden	Main	Yes
EdMn07	NY 614253	Eden	Main	Yes
EdMn08	NY 641235	Eden	Main	Yes
EdMn09	NY 687197	Eden	Main	No
EdMn10	NY 727158	Eden	Main	Yes
EdMn11	NY 743151	Eden	Main	Yes
EdMn12	NY 765131	Eden	Main	Yes
EdMn13	NY 768121	Eden	Main	Yes
EdMn14	NY 771104	Eden	Main	Yes
EdMn15	NY 774095	Eden	Main	Yes
EdMn16	NY 775090	Eden	Main	No
EdMn17	NY 772074	Eden	Main	No
EdMn18	NY 781027	Eden	Main	Yes
EdMn19	SD 779988	Eden	Main	No
TwBo01	NT 971313	Tweed	Bowmont Water	Yes
TwBo02	NT 962302	Tweed	Bowmont Water	Yes
TwBo03	NT 955302	Tweed	Bowmont Water	Yes

Site Ref	Grid Ref	SAC	Tributary	Signs
TwBo04	NT 956297	Tweed	Trib	Yes
TwBo05	NT 907303	Tweed	College Burn	Yes
TwBo06	NT 886325	Tweed	Trib	No
TwBo07	NT 886329	Tweed	Bowmont Water	Yes
TwBo08	NT 874333	Tweed	Bowmont Water	Yes
TwBo09	NT 853333	Tweed	Bowmont Water	Yes
TwMn01	NT 974517	Tweed	Main	No
TwMn02	NT 957525	Tweed	Whiteadder	No
TwMn03	NT 926523	Tweed	Trib	Yes
TwMn04	NT 920515	Tweed	Trib	No
TwMn05	NT 934510	Tweed	Main	Yes
TwMn06	NT 938488	Tweed	Trib	No
TwMn07	NT 903475	Tweed	Trib	Yes
TwMn08	NT 890472	Tweed	Main	Yes
TwMn09	NT 874451	Tweed	Simprim Burn	Yes
TwMn10	NT 870440	Tweed	Trib	Yes
TwMn11	NT 849400	Tweed	Main	Yes
TwTi01	NT 885432	Tweed	Till	Yes
TwTi03	NT 929400	Tweed	Trib	No
TwTi05	NT 933384	Tweed	Till	Yes
TwTi06	NT 939374	Tweed	Till	Yes
TwTi02	NT 934412	Tweed	Trib	No
TwTi07	NT 955357	Tweed	Trib	Yes
TwTi08	NT 946337	Tweed	Till	Yes
TwTi09	NT 996326	Tweed	Trib	Yes
TwTi10	NT 998307	Tweed	Till	Yes
TwTi11	NU 018294	Tweed	Till	No
TwTi12	NU 040298	Tweed	Hetton Burn	Yes
TwTi13	NU 039294	Tweed	Till	Yes
TwTi14	NU 058298	Tweed	Till	Yes
TwTi15	NU 061284	Tweed	Till	Yes
TwTi16	NU 055277	Tweed	Till	Yes
TwTi17	NU 049251	Tweed	Till	Yes
TwTi18	NU 044238	Tweed	Liburn Burn	No
TwTi19	NU 047234	Tweed	Trib	Yes
TwTi20	NU 056224	Tweed	Breamish	Yes
TwTi21	NU 065218	Tweed	Kirk Burn	No
TwTi22	NU 076204	Tweed	Breamish	No
TwTi23	NU 058171	Tweed	Breamish	Yes
TwTi25	NU 031167	Tweed	Reavely Burn	Yes
TwTi26	NU 017164	Tweed	Breamish	No
TwTi27	NT 996166	Tweed	Breamish	No
TwTi28	NT 990164	Tweed	Roddan Burn	Yes
TwWo01	NT 994282	Tweed	Wooler Water	Yes
TwWo02	NT 994278	Tweed	Wooler Water	No
TwWo03	NU 000260	Tweed	Wooler Water	Yes
TwWo04	NT 997248	Tweed	Wooler Water	Yes
TwWo05	NT 975250	Tweed	Carey Burn	Yes

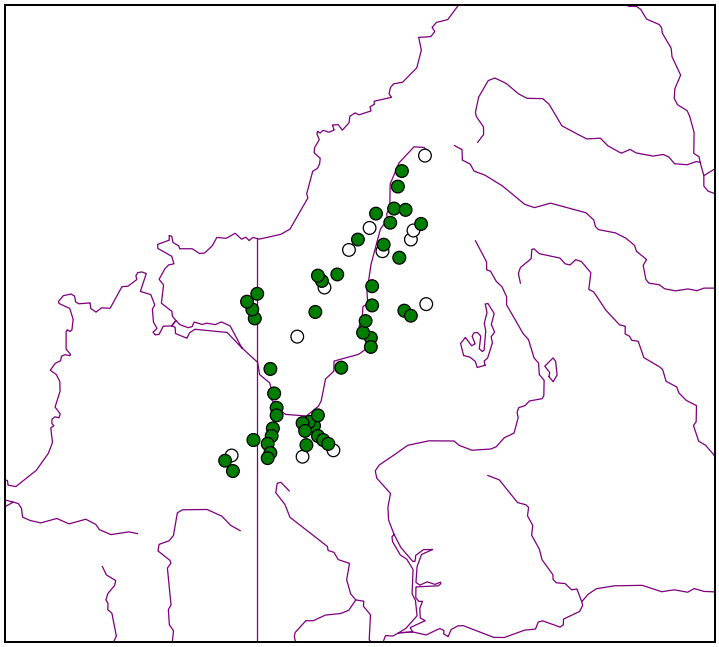
Site Ref	Grid Ref	SAC	Tributary	Signs
TwWo06	NT 963232	Tweed	Wooler Water	Yes
TwWo07	NT 954224	Tweed	Wooler Water	No
WyAr01	SO 507568	Wye	Arrow	Yes
WyAr02	SO 497570	Wye	Arrow	Yes
WyAr03	SO 474570	Wye	Arrow	No
WyAr04	SO 460577	Wye	Arrow	Yes
WyAr05	SO 461578	Wye	Arrow	Yes
WyAr06	SO 437586	Wye	Arrow	Yes
WyAr07	SO 419586	Wye	Arrow	Yes
WyAr08	SO 415587	Wye	Arrow	Yes
WyAr09	SO 390584	Wye	Arrow	Yes
WyAr10	SO 373595	Wye	Arrow	Yes
WyAr11	SO 333586	Wye	Arrow	Yes
WyAr12	SO 328585	Wye	Arrow	No
WyAr13	SO 316572	Wye	Arrow	Yes
WyAr14	SO 303565	Wye	Arrow	Yes
WyAr15	SO 299564	Wye	Arrow	Yes
WyAr16	SO 280551	Wye	Arrow	Yes
WyAr17	SO 273543	Wye	Arrow	No
WyFr01	SO 565392	Wye	Frome	No
WyFr02	SO 574403	Wye	Frome	Yes
WyFr03	SO 598419	Wye	Frome	Yes
WyFr04	SO 613426	Wye	Frome	Yes
WyFr05	SO 633433	Wye	Frome	No
WyFr06	SO 658469	Wye	Frome	Yes
WyFr07	SO 662476	Wye	Frome	Yes
WyFr08	SO 665478	Wye	Frome	Yes
WyFr09	SO 666488	Wye	Frome	Yes
WyFr10	SO 670501	Wye	Frome	Yes
WyFr11	SO 662530	Wye	Frome	Yes
WyFr12	SO 658544	Wye	Frome	Yes
WyFr13	SO 658549	Wye	Frome	Yes
WyFr14	SO 650556	Wye	Frome	Yes
WyFr15	SO 631559	Wye	Frome	Yes
WyLu01	SO 570374	Wye	Lugg	Yes
WyLu02	SO 546406	Wye	Lugg	Yes
WyLu03	SO 531418	Wye	Lugg	Yes
WyLu04	SO 528446	Wye	Lugg	Yes
WyLu05	SO 512459	Wye	Lugg	Yes
WyLu06	SO 518476	Wye	Lugg	Yes
WyLu07	SO 534511	Wye	Lugg	Yes
WyLu08	SO 514528	Wye	Lugg	Yes
WyLu09	SO 507585	Wye	Lugg	Yes
WyLu10	SO 503588	Wye	Lugg	Yes
WyLu11	SO 501595	Wye	Lugg	Yes
WyLu12	SO 495593	Wye	Lugg	Yes
WyLu13	SO 492599	Wye	Lugg	Yes
WyLu14	SO 448621	Wye	Lugg	Yes

Site Ref	Grid Ref	SAC	Tributary	Signs
WyLu15	SO 426636	Wye	Lugg	Yes
WyLu16	SO 425654	Wye	Lugg	Yes
WyLu17	SO 398654	Wye	Lugg	Yes
WyLu18	SO 380652	Wye	Lugg	Yes
WyLu19	SO 363646	Wye	Lugg	Yes
WyLu20	SO 348640	Wye	Lugg	Yes
WyLu21	SO 345634	Wye	Hindwell Brook	Yes
WyMn01	SO 567181	Wye	Main	No
WyMn02	SO 580192	Wye	Main	Yes
WyMn03	SO 590242	Wye	Main	Yes
WyMn04	SO 592247	Wye	Main	Yes
WyMn05	SO 548294	Wye	Main	No
WyMn06	SO 567365	Wye	Main	Yes
WyMn07	SO 508395	Wye	Main	Yes
WyMn08	SO 412424	Wye	Main	No
WyMn09	SO 336446	Wye	Main	Yes
WyMn10	SO 258474	Wye	Main	Yes
TwTi04	NT 925395	Tweed	Till	Yes
TwTi24	NU 040169	Tweed	Breamish	Yes

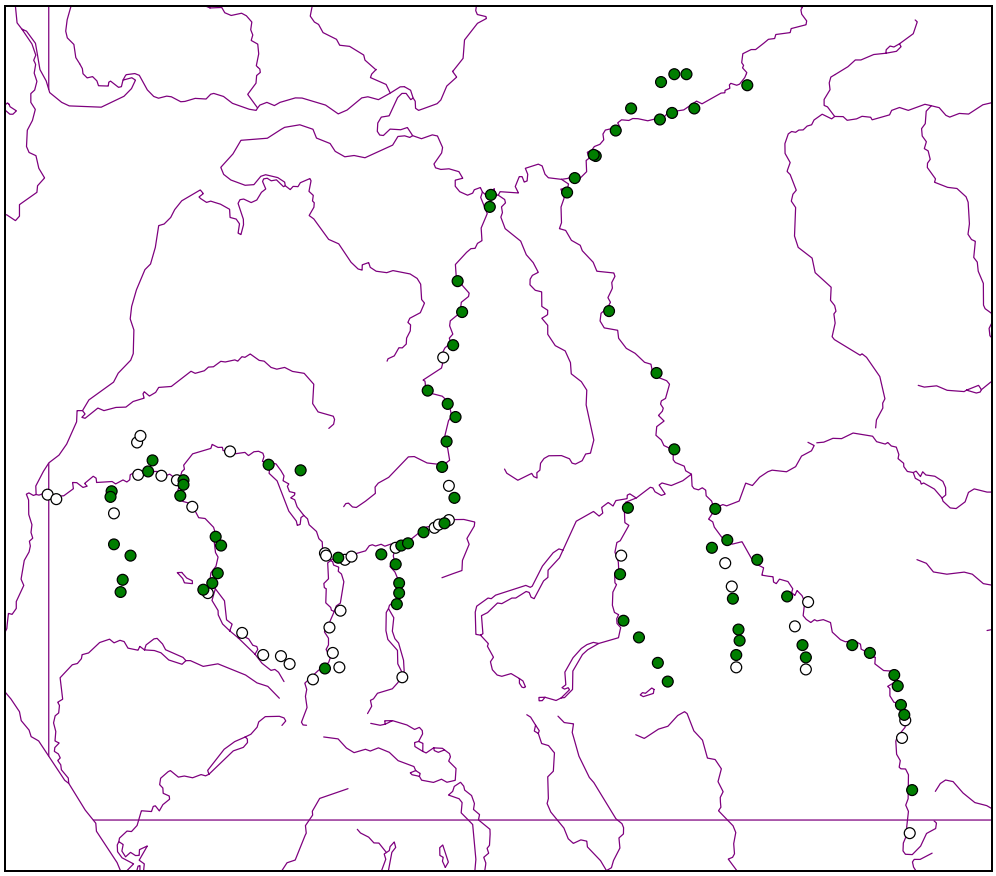
Appendix B. Survey results

Maps created in DMAP. Filled circles are positive.

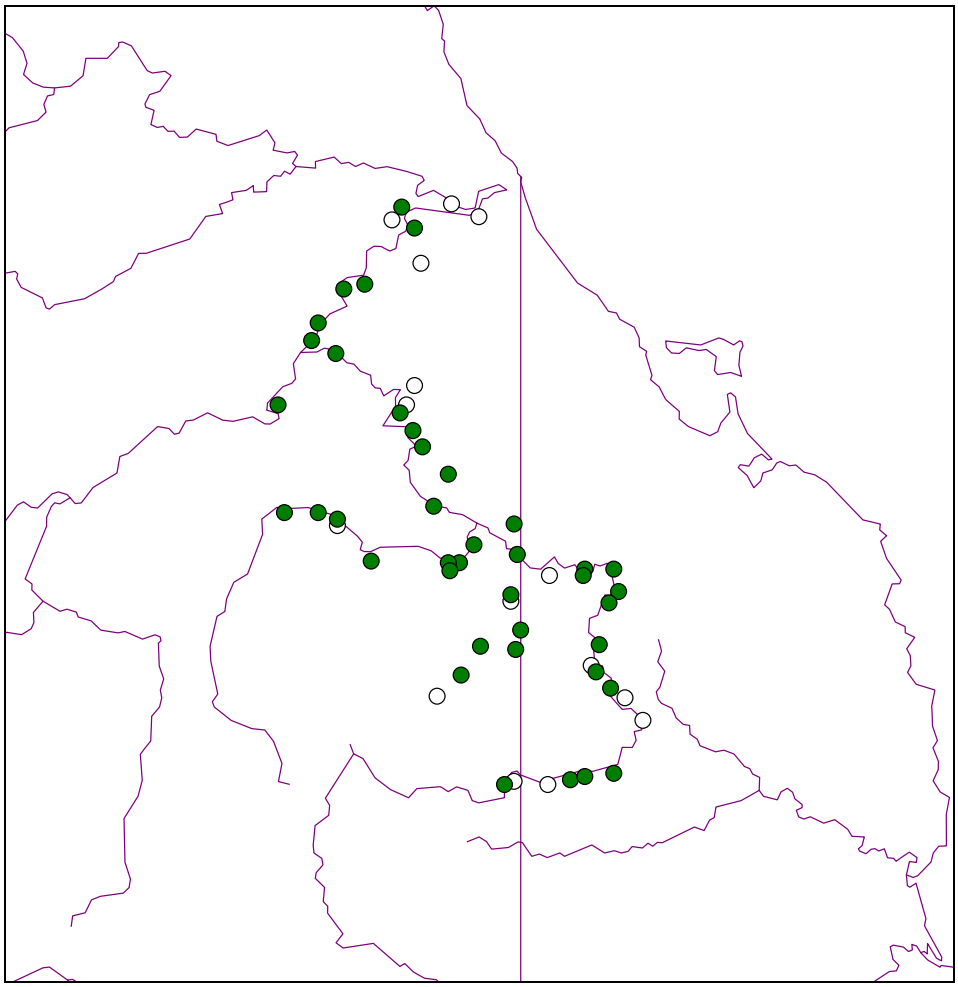
Camel



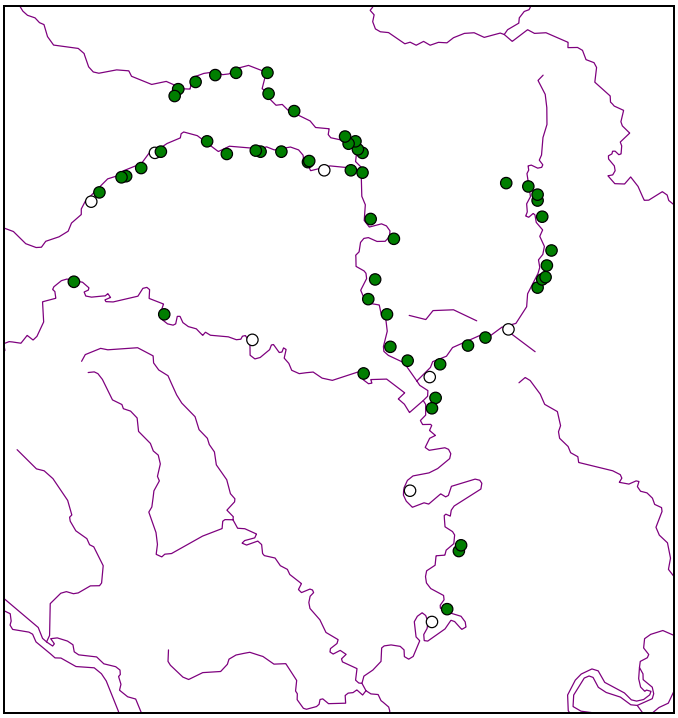
Derwent and Eden



Tweed



Wye



Appendix C. Artificial spraint site on Camel

Site Reference: CaAn04

Grid Reference: SX 052777

Clean up boulder or place another alongside, outside course of river.

Appendix D.

a) Otter monitoring form as used in the survey

b) Form recommended for future use.

a)

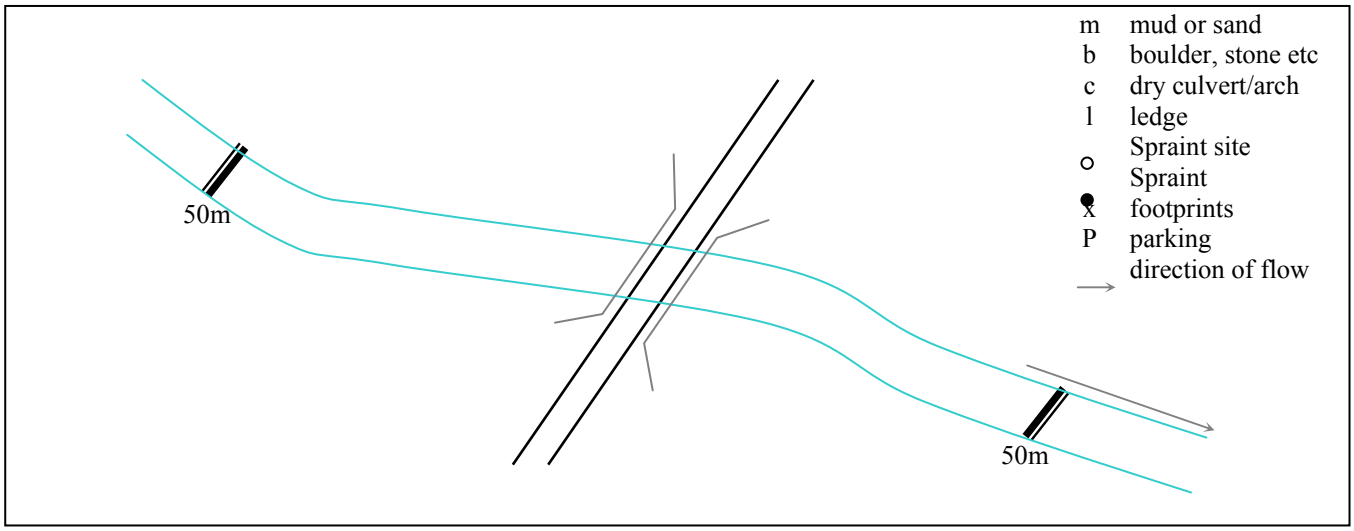
Potential spraint monitoring sites **River:**

Site ref number		Sub catchment	
Grid Ref.		Stream name	

Suitable for use?	Yes/No/Possibly	Width at bridge	<5m / 5-15m / 15-30m/ >30m
Needs Artif. Site?	Yes/No/Possibly	Max depth under bridge	<25cm / 25-75cm / >75cm
Permission needed?	Yes/No		

Spraints recorded	Dried Fragmented:	Dried intact:	Not fully dry:
Footprints found?	Yes/No	Other sign:	

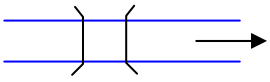
Mark: nature and position of potential spraint sites; location and type of signs found; parking place.



Notes on:

Suitability:

Need for artificial spraint site:



Potential spraints sites (>5m from bridge):

Parking:

Access:

Hazards:

Post survey notes:

Photograph refs:

b)

Potential spraint monitoring sites **River:**

Site ref number		Sub catchment	
Grid Ref.		Stream name	

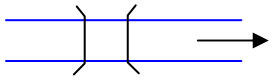
Suitable for use?	Yes/No/Possibly	Width at bridge	<5m / 5-15m / 15-30m/ >30m
Needs Artif. Site?	Yes/No/Possibly	Max depth under bridge	<25cm / 25-75cm / >75cm
Permission needed?	Yes/No		

Spraints recorded	Dried Fragmented:	Dried intact:	Not fully dry:
Footprints found?	Yes/No	Other sign:	

Notes on:

Suitability: give details only if a 'possible site':

Need for artificial spraint site (use diagram left to indicate location):



Potential spraint sites (if not obvious and if more than 5m from bridge):

Parking (if not obvious):

Access: restrictions, if not obvious; where to get permission:

Hazards:

Notes:

Photograph refs:

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Top left: Using a home-made moth trap.
Peter Wakely/English Nature 17,396
Middle left: Co_2 experiment at Roudsea Wood and Mosses NNR, Lancashire.
Peter Wakely/English Nature 21,792
Bottom left: Radio tracking a hare on Pawlett Hams, Somerset.
Paul Glendell/English Nature 23,020
Main: Identifying moths caught in a moth trap at Ham Wall NNR, Somerset.
Paul Glendell/English Nature 24,888